Q. Please state your name, occupation, and business address.

A. My name is Barry G. Cunningham. My business address is 201 South Main, Suite 2300, One Utah Center, Salt Lake City, Utah. My position is Vice President of Generation for PacifiCorp.

Qualifications

Q. Please describe your education and business experience.

A. I have a Bachelor of Arts degree in Physical Science. During my career with PacifiCorp, I have served as a Trainer, Training Manager, Assistant Operations Superintendent, a Maintenance Superintendent, a Plant Manager and the Director of Technical Support with responsibility for all the small plants. I became Assistant VP of Generation in 1998 and VP of Generation in 1999 with responsibility for all thermal and hydro generation assets.

Purpose of Testimony

Q. What is the purpose of your testimony?

A. I will describe the Hunter Unit Number 1 ("Unit 1") generator outage that occurred on November 24, 2000 and the circumstances leading up to the outage. In addition, I will describe what PacifiCorp has been able to determine about the cause of the generator outage.

Description of Unit and Generator

Q. Please describe Unit 1.

A. Hunter Plant is a three-unit coal fired steam-electric plant located three miles south of Castle Dale, Utah. Construction of Unit 1 began in March 1975, and commercial operation began June 1, 1978. Stearns-Roger, an engineering company that was located in Denver, Colorado, designed Unit 1. Jelco, a Utah based construction company, constructed the unit. The official net output rating for Unit 1 is 430 megawatts.

Q. Please describe the ownership of Unit 1.

A. PacifiCorp operates the Hunter plant. PacifiCorp and Utah Municipal Power Agency jointly own Unit 1 with ownership interests of 93.75 percent and 6.25 percent respectively.

Q. Please describe the operation of Unit 1.

A. The owners use Hunter Unit 1 for base load.

Q. Please describe the Unit 1 electric generator.

A. The generator was manufactured by Westinghouse Electric Corporation ("Westinghouse"), now part of Siemens Westinghouse Power Corporation ("Siemens Westinghouse"). The generator is a two pole, hydrogen inner-cooled machine rated at 496 megavolt-amperes ("MVA"). The output voltage of the generator is 24,000 Volts. The frame size is 2-104 x 225. Westinghouse has manufactured generators of the same basic design and construction for over 30 years. Twenty-eight generators of this same frame size were built and are in service in the United States and Spain.

Q. Please describe the general arrangement and construction of the generator.

A. Exhibit No. 8 shows the arrangement of the generator equipment. The generator, exciter, and permanent magnet generator ("PMG") are each a rotating electrical machine with their shafts coupled end to end. The steam turbine drives the generator, the exciter, and the PMG.

The generator consists of the following major components:

- Frame and bearing brackets
- Stator with armature winding
- Rotor with field winding
- Cooling system
- Exciter, PMG and voltage regulator.

Exhibit No. 9 illustrates the major components of the generator. The frame is fabricated from welded steel plate and forms the shell of the generator. The frame is designed as a pressure vessel that contains the hydrogen gas that is used to cool the generator. Two heat exchangers called hydrogen coolers are mounted inside the generator frame on the turbine end. These heat exchangers cool the hydrogen that is circulated through the generator when it is in operation. Bearing brackets enclose each end of the generator. These brackets carry the generator bearings and their associated hydrogen seals. The hydrogen seals prevent hydrogen gas from leaking out around the shaft. The generator frame weighs approximately 100 tons.

The stator core is constructed inside the generator frame. The core has the shape of a large hollow cylinder that is 104 inches in diameter and is 225 inches long. A cylindrical cage made from building bolts and bore rings is installed inside the stator frame. The stator core is fitted inside this cage of building bolts. The core consists of many layers or laminations of sheet steel. Each lamination of steel is 0.018 inch thick and is coated on each side with a thin layer of varnish-like insulating material. Each layer or lamination consists of nine segments that each clip on to the building bolts. Exhibit No. 10 shows the Unit 1 core being constructed. The laminations are arranged in 3-inch thick packs. Exhibit No. 11 shows the arrangement of the stator laminations and winding installation. In between each pack is a ventilation space 0.125 inches wide through which hydrogen cooling gas flows. Each end of the core is finished with a system of finger plates, end plate and core support plates. Through bolts are inserted through the laminations, finger plates, end plate and core support plates. The through bolts and building bolts clamp the core together axially. The bore rings that surround the core are also tightened to clamp the core radially. A small ring of laminations called a flux shield is installed on each end of the core to help direct the magnetic fields in the generator. The stator windings (coils), in which electricity flows, are installed in slots in the bore of the stacked stator body. Each winding is held securely in its stator slot with a system of filler strips, ripple springs and wedges.

The generator rotor, which is a long solid cylindrical steel forging, contains the field winding. It rotates inside the bore of the stator. Exhibit No. 12 shows a typical generator rotor. The rotor weighs approximately 60 tons and is supported by the bearings on each end of the generator. The bearing on the turbine end is No. 5 bearing and the bearing on the exciter end is No. 6 bearing. The field winding is contained in slots that are machined into the rotor. The rotor has a multi-stage blower mounted on the turbine end that circulates the hydrogen cooling gas through the generator and the hydrogen coolers. Hydrogen cooling gas flows in parallel through the windings, the stator core, and the rotor. The hydrogen carries heat away from these components and passes through the rotor blower to the hydrogen coolers where it is cooled again.

The purpose of the exciter is to provide electric energy to the field winding of the generator rotor. Exhibit No. 8 illustrates how the PMG, exciter, generator and voltage regulator are interconnected. The PMG produces electrical energy that supplies the voltage regulator. The voltage regulator output energizes the field winding of the exciter. The exciter output then energizes the field winding of the generator. The voltage regulator controls the main generator voltage level by regulating the input to the exciter field winding.

Description of Incident

Q. Please describe the condition of the plant at the time of the incident.

A. The incident occurred during the day shift of Friday, November 24, 2000, the day following the Thanksgiving holiday. All three Hunter generating units were operating near full load. Operating conditions in the plant were normal. Transmission system conditions were also normal. The Unit 1 generator net output was approximately 415 megawatts.

Q. Please describe the incident.

A. The first indication of abnormal conditions was at 12:38:53 when the Number 5 bearing alarmed with a temperature indication of -262.6°F, which is impossibly low. Exhibit No. 8 shows a diagram of the bearing arrangement. This alarm continued to clear and re-occur during the event. The alarm would clear and indicate a normal bearing temperature. The alarm would then re-occur and indicate bearing temperature at -262.6°F. About 40 seconds after the first temperature alarm, the Number 6 bearing vibration alarm annunciated at a value of 5.29 mils displacement. The bearing alarms when vibration exceeds 5.0 mils. The Control Room Operator ("CRO") sent the Plant Operator ("PO") out to visually inspect the generator for any problems. The CRO verified that bearing drain temperatures were normal. In parallel with the PO's inspection, the shift supervisor and CRO began reviewing potential causes of high vibration. They checked the "Water Induction" displays and the "Bearing Oil Drain Temperature" display. During this period of time, a generator winding cooling gas differential temperature alarm annunciated and then returned to normal. The PO returned to report that vibration was perceptibly more than normal and that sparks could be seen at the joints of the generator frame and cowling and that heavy arcing was occurring around the ground straps near Number 5 bearing. During this exchange of information, the unit tripped automatically due to operation of the Loss of Field relay. The elapsed time of the event from first alarm until trip was about 5½ minutes. The turbine generator then coasted down to turning gear speed in approximately 45 minutes.

Immediate Response and Damage to the Generator

Q. Please describe the immediate response taken by PacifiCorp personnel.

A. Plant personnel immediately initiated emergency procedures, and began damage control and then proceeded with an initial inspection and event assessment. Arcing had created a hole in an exciter bearing oil pipe allowing oil to leak. The oil was running down into the voltage regulator cabinets on the level below the generator exciter. Immediate action was taken to control the oil leak and to protect the voltage regulator controls from the oil. Plant management personnel were contacted and traveled immediately to the site. The PacifiCorp staff engineer responsible for generators was contacted and arrived on site Saturday, November 25, 2000. Siemens Westinghouse was contacted on Friday, November 24, 2000. Saturday morning, a Siemens Westinghouse service engineer made arrangements for a tool trailer to be delivered to the site and then traveled to the site to assist in the inspection and disassembly of the generator. I was contacted on Friday afternoon and again Saturday morning. I traveled to the site on Saturday to participate in the initial inspections.

Q. Please describe the initial assessment of the damage.

A. First indications of failure were in the exciter housing where it could be observed that the PMG that supplies energy to the voltage regulator was damaged. Bearing vibration sensor wiring was burned off the number 7 exciter bearing. Areas of sparking/arcing were noted on many external locations on the generator.

After the initial inspections, it was determined that an internal inspection of the generator was necessary. The generator was purged of hydrogen late on Friday, November 24th and into the morning of the 25th. PacifiCorp personnel removed inspection covers to begin inspection while the turbine-generator was on turning gear. A solidified mass of previously molten metal was observed in the exciter end of the generator. Arrangements were made for Fluor to provide millwrights to continue disassembly work on Sunday morning. Fluor is a maintenance company that has a contract to supply supervision and maintenance workforce to the Hunter Plant. Hydrogen coolers and bearing brackets were removed on Sunday. Around the clock teardown began with Sunday dayshift. Electrical insulation testing by Siemens Westinghouse and PacifiCorp showed no problems in the field winding or stator windings. The upper half of the bearing brackets on both ends of the machine was removed. At this point, it was clear that major damage had occurred in the generator. Initial inspections noted solidified masses of molten metal hanging off winding end turns on each end of the core. Based on these observations work continued to remove the rotor. Arcing damage was noted in several areas as parts were removed from the generator. The PMG sustained major damage due to arcing across the air gap between the PMG rotor and the PMG stator magnets. The number 4 turbine bearing and journal sustained damage due to sparking/arcing within the bearing. The carbon brush and copper braid used to ground the turbine generator shaft between the low-pressure turbine and generator were burned off.

Q. When was the decision made to completely rebuild the core?

A. The molten iron in each end of the generator indicated damage to the core. The outside circumference of the core visible through inspection covers showed no visible damage. Since the windings had not failed, our initial belief was that core damage could be limited to the ends of the generator and repair might be possible by restacking only the ends of the core with the generator on its foundation. Siemens Westinghouse winders, specialists in rebuilding generators, began arriving on site on Monday, November 27. The rotor was removed by late the next day. Removal of the windings began on November 29. As the windings were removed from the core, it became obvious that the damage to the core extended the entire length of the generator stator core (225 inches) and consequently, the total stator core would need to be completely rebuilt. The winding removal was completed on December 7, 2000. Fluor millwrights and Siemens Westinghouse winders working under the supervision of Siemens Westinghouse service engineers worked around the clock to remove stator core iron. The old core iron was removed from the frame by December 20, 2000.

Q. Please describe the overall damage sustained by the turbine-generator.

A. The stator windings and core sustained the majority of the damage. The initial insulation test of the windings, performed with a low voltage, did not indicate a problem. However, the windings did fail when a direct current high potential test placed the windings under more electrical stress. The insulation had most likely been weakened by heat where it was in contact with the molten iron. The winding insulation was visibly discolored and damaged in the areas where it was in contact with the molten iron. The core melted in three separate areas. Exhibit No. 13 shows the areas of damage:

- Below stator slot 21, a tunnel like hole was melted through the core iron from one end of the generator to the other end. The hole was like a small cavern that varied in size from 1½ inches to 5 inches in diameter. The total length was about 225 inches. Molten iron from this cavern spilled out each end of the core and flowed down across the windings into the end of the generator. The cavern enveloped a portion of the through bolt hole. Approximately 4½ feet of the high-strength, core clamping through bolt was melted away below slot 21, close to the exciter end of the generator. The cavern also enveloped a corner of slot 21 for part of the length of the generator.

- Below stator slot 10, approximately 4 feet of the exciter end of the through bolt was melted. The core surrounding the melted portion of the through bolt also began to melt. The melted core was concentric with the through bolt hole.
- A tunnel like hole enveloping the corner of slot 27 on the exciter end was melted for a length of approximately 2 feet.

In addition to this major damage to the core iron, the exciter end flux shield showed signs of heating damage. Some melting had also occurred on the turbine end flux shield at through bolt number 10. Other core components such as core support plates, finger plates, and end plates were damaged by the molten core iron.

In addition to the stator core, damage was sustained in the following areas:

- Damage to the turbine was limited to the number 4 bearing and journal. The bearing was damaged by extremely high shaft current that flowed from the generator rotor through the bearing as the generator failed. The steam turbine was inspected using fiber optic equipment that was inserted into the turbine through quick look inspection ports that were installed during the 1999 overhaul. No damage was observed during the inspection.
- Damage to the voltage regulator was limited to that caused by lubricating oil from the exciter bearing oil leak. A number of components required disassembly and clean up.

- The PMG that supplies electric energy to the voltage regulator sustained significant damage. Stray currents arcing across the air gap in the PMG damaged the permanent magnets and destroyed the stator iron.
- The vibration sensor and associated electrical wiring were burned off the exciter bearing. A hole was burned in the lube oil piping to the exciter.
- As the core failed, the hydrogen cooling gas that is circulated at high velocities through the generator scattered small pellets of molten core iron throughout the generator. Both hydrogen coolers had a significant amount of core iron material imbedded between cooling fins.

Repair Options

Q. Describe what action was taken to initiate repairs.

A. Repair program project teams were assigned on Tuesday, November 28. A technical lead person was assigned to oversee and coordinate the on-site disassembly of the generator. Another technical lead person was assigned to oversee off-site work. This person was dispatched to the Siemens Westinghouse Orlando, Florida, office to work with Siemens Westinghouse staff on repair options, material availability, and possible full stator replacements. This effort continued through the weekend and into the week of December 4. Alstom and GE, both major manufacturers of large utility generators, were also contacted to solicit proposals for repairs.

Q. Please describe the actions taken to consider alternative options.

A. A search for possible replacement units was conducted in parallel with the generator repair planning. PacifiCorp identified generators within the U.S. that potentially matched the Hunter Unit 1 generator and that could possibly be brokered for a swap. Siemens Westinghouse reviewed the interchangeability of the identified units with Hunter Unit 1. PacifiCorp contacted the owners. Three possibilities emerged:

- On December 4, PacifiCorp management contacted Reliant Energy about the feasibility of using the generator from Green Bayou Unit Number 5.
- On December 4, PacifiCorp management contacted Excelon about the feasibility of using a generator from one of the Eddystone Station units.
- PacifiCorp management also contacted City of San Antonio to discuss the feasibility of acquiring a spare stator that had been manufactured by Alstom to fit a matching Westinghouse generator at the JT Deely Station in San Antonio, Texas. The JT Deely unit was scheduled to continue operating in a derated output mode until Spring 2001 when the new Alstom stator core and winding would be installed.

The Eddystone and JT Deely options were explored in detail. Reliant Energy management did not want to consider participating in a swap. A team of PacifiCorp personnel were dispatched to San Antonio and then to Philadelphia to negotiate the potential options.

Q. Please describe the details of the San Antonio option.

A. The San Antonio option consisted of acquiring a new stator that was built for the Deely Station. The general elements of this option are as follows:

- PacifiCorp would buy the Alstom generator stator from San Antonio.

- PacifiCorp would pay the city for replacement energy during the period of construction of the replacement Alstom stator, a period estimated to be 14 months. This payment would cover the derate of the operating Deely unit.
- PacifiCorp would purchase a replacement stator from Alstom for the JT Deely station.
- PacifiCorp would pay Alstom to ship the Deely generator stator to the Hunter Plant and to install the stator on Unit 1.
- PacifiCorp would also pay for replacement energy if the JT Deely unit's existing stator failed during the period required to construct the replacement stator.

Q. Please describe the details of the Excelon Eddystone option.

A. The Eddystone option consisted of acquiring an existing operating generator from Excelon Eddystone Station, Philadelphia, Pennsylvania.

- PacifiCorp would purchase the Eddystone Station Unit 3 generator stator.
- Westinghouse would remove the Eddystone generator stator, ship the stator to the Hunter Plant and install in Unit 1.
- Westinghouse would ship the Unit 1 generator stator frame to the Eddystone station, install new core and windings, and install the rebuilt generator stator on Eddystone Unit 3.
- For each day that Eddystone Unit 3 was not available after April 15, PacifiCorp would buy, at market prices, the quantity of energy that the unit historically had produced and would sell that energy to Excelon at the cost of producing the energy at Eddystone.

This option required transporting the generator stator with windings approximately 3,700 miles by water and rail. The stator weighs approximately 235 tons. The physical size and weight of the stator prohibited moving the stator along rail corridors in the eastern U.S. The transportation plan for moving the Eddystone stator to the Hunter Plant consisted of transport by barge from Philadelphia to Houston and by rail from Houston to Price and by truck from Price to Hunter Plant. The stator was four years older than the stator that failed at Hunter Plant. Also, the stator winding end turn support system did not have the upgrades that had been installed previously on Hunter Unit 1 generator. The Eddystone unit had been used in a peaking mode with over one hundred and fifty start-ups per year giving rise to concerns about its reliability. The plan was to test the stator to insure it was in good condition before disassembly of the Eddystone generator and then to retest after delivery to the Hunter Plant. No plans were made to rebuild or upgrade the stator.

Q. What was considered to be the best option?

A. During the time the generator was being disassembled, PacifiCorp considered its options and decided that the best available option was to rebuild the damaged generator. The San Antonio Deely option was ultimately not selected because the San Antonio management wanted to increase substantially the negotiated premium and the city negotiators could not get approval to proceed. In addition, PacifiCorp would bear the risk of purchasing replacement energy for San Antonio, if the Deely unit stator failed between Spring 2001 and Spring 2002. The Eddystone option was not selected because of the risks associated with shipping the stator and the risks associated with installing a used stator that was older with fewer upgrades than the stator that had failed in Unit 1.

Rebuild/Repair Process

Q. Describe the project organization for the generator rebuild.

A. PacifiCorp established a project manager for the generator rebuild project. At the Hunter Plant site, a lead technical person had responsibility for coordinating all PacifiCorp activities with Siemens Westinghouse activities and responsibility to clear any "road blocks" to the generator repair activities. A second lead technical person had the responsibility to facilitate and expedite the off-site manufacture and repair of the components required. This person worked closely with the Siemens Westinghouse team to ensure that materials were delivered as necessary. Siemens Westinghouse also established a project manager and team in Orlando for the generator rebuild. A lead engineer in Orlando for the project was also assigned. At the Hunter site, Siemens Westinghouse had a site project manager who managed and coordinated all activities on site. The total Siemens Westinghouse workforce on site averaged approximately 45 persons. A conference call was conducted every weekday and most weekends to coordinate activities. The Siemens Westinghouse site project manager updated the project schedule and forecast completion dates daily. Status reports of repair progress were prepared daily for Siemens Westinghouse management and PacifiCorp management. These reports included progress against schedule, explanations for delays in schedule, and forecasts of completion dates. It should be noted that this was the largest generator stator core that Siemens Westinghouse had rebuilt in the field in the United States.

Q. Why was it decided that the generator should be rebuilt at the plant site?

A. The critical issue was to return the unit to service as quickly as possible with confidence in its reliability. The rebuilding of the stator was the critical path of the generator repair. The rotor, exciter, and other components could be refurbished in parallel with the generator stator and could be completed in less time. The physical size of the stator required that it be transported by rail. The repair facility was located in Charlotte, North Carolina. It was estimated that transportation would add an additional four weeks to the repair schedule if no difficulties were encountered. Therefore the decision was made to rebuild the stator on the plant site.

Q. Please describe briefly the magnitude of the repairs.

A. The generator stator core and windings were replaced. The old windings and core were removed from the generator frame. Manufacture of new windings was not a critical path item because PacifiCorp had previously procured a set of windings. A special foundation fitted with a building plate supplied by Siemens Westinghouse was constructed on the ground floor of the plant. The generator frame that weighs 105 tons was removed from its foundation and turned up on end on the building plate. New building bolts, new through bolts, and new stator core iron were installed in the stator frame. Over 100,000 new pieces of core iron and fittings were installed in the stator frame. The generator frame complete with new core weighed approximately 235 tons. The complete assembly was lifted back on to the generator foundation using a crane that was specially built and erected in the plant for that purpose. The new core was consolidated and tested. New windings were installed and tested.

The rotor was refurbished in parallel with the stator rebuild. The rebuild of the rotor was competitively bid and Alstom offered the lowest price and fastest rebuild schedule. The 60-ton rotor was shipped to Altsom's Richmond, Virginia shop by truck on December 14, 2000. The generator rotor was completely disassembled and inspected to ensure that there was no damage and that there were no pellets of core iron in the rotor cooling passages or under the retaining rings that could ultimately result in a shorted or grounded field (rotor winding). The rotor was rewound with the original copper winding. A new coupling was manufactured and installed. This particular type of rotor has a tendency to develop cracks near the tooth tops of the rotor forging. While being rebuilt, a modification was made to eliminate the potential for cracking. New field retaining rings were manufactured from an improved 18-18 alloy and installed to eliminate the risk of stress corrosion failure associated with the original 18-5 alloy rings. The rotor was high speed balanced, electrically tested, and trucked back to the plant on March 28, 2001. New rotating blower blades were fitted on the rotor at the plant site. New stationary blower blades were manufactured and fitted into the generator during reassembly.

The exciter and PMG were trucked to the Siemens Westinghouse facility in Charlotte, North Carolina. The exciter was disassembled, inspected and refurbished to ensure that no damage was sustained from stray currents and arcing that occurred in the exciter cubicle. The PMG was completely rebuilt with new stator iron and a new winding. New permanent magnets were also installed. The refurbished exciter-PMG assembly was balanced, tested, and shipped back to the plant on March 30, 2001.

Hydrogen coolers were shipped to Harris Tube Service in Salt Lake City and fitted with new tubes. Harris Tube Service is a Salt Lake City company that specializes in the repair and maintenance of heat exchangers and tube replacement.

The voltage regulator was inspected, cleaned and tested. Components were disassembled as necessary to clean-up oil residue from exciter lube oil leak.

Q. Please provide an overview of the repair schedule.

A. The following is a chronology of the major milestones:

November 24, 1999	Generator Failed
November 25, 2000	Disassembly commenced
November 29, 2000	Rotor removed, damage assessed
November 30, 2000	Decision made to replace complete stator core
December 18, 2000	Option to rebuild was selected
December 20, 2000	All damaged components are removed
December 29, 2000	Stator frame was upended on building plate
February 20, 2001	Completed core installation
February 22, 2001	Rebuilt stator frame and core back on foundation
March 7, 2001	Completed core consolidation and core testing
March 8, 2001	Began installing winding coils

April 19, 2001	Complete high potential test of windings
April 19, 2001	Reassembly of generator commenced
April 26, 2001	Unit on turning gear, air test complete
April 28, 2001	Initial synchronization
May 1, 2001	Generator in service and commenced generator testing
May 2, 2001	Identified winding cooling problem
May 6, 2001	Unit removed from service, inspection covers removed, repairs completed on winding cooling problem
May 7, 2001	Generator in service and testing resumed
May 8, 2001	Generator was released for normal operation.

Q. When was Hunter Unit 1 returned to service?

A. The first synchronization occurred on April 28, 2001. Final tests were completed on May 8, 2001.

Cause of Failure

Q. Has a cause of the failure been determined?

A. No. The generator failure resulted from a shorting of laminations within the generator stator core. The location of the initial failure has been determined to be 5-6 feet from the exciter end of the stator between the through bolt and the bottom of Slot 21 as illustrated in Exhibit No. 13. The root cause of the shorting has not been determined. Evidence of the root cause was most likely destroyed in the process of the generator failure.

Q. Describe your investigation process for this generator incident.

A. Plant personnel began preparing for an internal investigation of the generator failure in parallel with the initial generator inspection. Plant personnel gathered all plant records associated with the operation of the generator and the November 24 generator outage. Power Supply Technical Services immediately engaged the services of Bob Ward, a retired Westinghouse generator engineer whom now consults. At the recommendation of Hartford Steam Boiler Company, the company insurance provider, Ron Halpern was engaged to also help in the initial review of the incident. Subsequently, PacifiCorp hired two additional consultants, Clyde Maughan and Dean Harrington, to participate in the review. Three of the four consultants visited the site to inspect the generator during the disassembly period. Plant personnel and Siemens Westinghouse personnel took many photographs of the generator components as the machine was disassembled. Following disassembly of the generator and removal of the core iron, PacifiCorp personnel convened a 3-day meeting in late January with Siemens Westinghouse personnel and the four consultants to review and discuss data.

Q. What have you determined regarding the cause of the failure?

A. We have not been able to determine a specific root cause of the failure. All persons that have examined the data are in general agreement that the failure occurred at a point in the core between the through bolt and the bottom of Slot 21 approximately 5-6 feet from the exciter end. This conclusion is based on the magnitude of the melting in this location relative to other locations. Also, the experts involved in the examination of the evidence agree that damage in other locations of the generator is consequential to the initial point of failure. All experts agree that the damage resulted from a break down of insulation between the laminations of the core that resulted in overheating caused by eddy currents within the area where the lamination insulation failed. The cause of the failure of lamination insulation has not been determined. Potential causes of overheating were identified. Some causes have been eliminated by the evidence that is available. A number of potential causes remain, but no hard evidence exists to identify one specific cause. The evidence of the cause was most likely destroyed in the failure.

Q. Is there any reason to believe that maintenance practices contributed to the failure of the generator?

A. No. The generator was overhauled by Siemens Westinghouse in June 1999. A complete inspection of the generator was performed. Siemens Westinghouse's 1999 overhaul report concluded, "*All tests showed this machine to be in good operating condition. The modifications made to this machine have put it into the high reliability range* . . . ."

Q. Were protective relays and automatic trip circuits working properly?

A. Yes. Protective relays had been calibrated during the 1999 overhaul and were in service. All automatic trip circuits were in service.

Q. Is there any evidence that the generator was operated improperly?

A. No. The generator is always operated within the design capability when synchronized to the system.

Q. Did any operator action cause or contribute to the failure?

A. The unit was operating at full load and the control room operator was monitoring his equipment at the time of the incident. There were no abnormal operating conditions or events on the morning of the generator failure. The control room operator, shift supervisor, and plant operator responded appropriately to the initial generator alarms and reacted correctly to the occurring events.

Q. Who insures the generator?

A. The generator is insured by a consortium of insurance companies. Hartford Steam Boiler Insurance Company is acting as the lead insurance company for this claim. Hartford Steam Boiler Insurance Company is investigating and adjusting the claim.

Q. What is the amount of the claim?

A. Invoices have been received from Alstom and Siemens Westinghouse. However, the exact amount of the claim remains to be determined because the Company has not yet completed the final review of the repair costs with the insurance company at this time. The estimated amount of the claim in US$ is:

Total Project Cost	$17,558,000
Insured Portion	16,991,000
Deductible	(2,250,000)
Claim	$14,741,000

Q. What position has Hartford Steam Boiler taken on this claim?

A. Hartford Steam Boiler has agreed to payment of the claim for the generator repair cost.

Q. Does this conclude your testimony?

A. Yes.